

CHAPTER 6

TRANSFORMING THE FORCE

For many years, a focus on near-term operational risk resulted in short-changing preparations for the future. By the time pressing warfighting and readiness requirements were met, there was little funding or attention available for addressing the risk posed by less familiar and seemingly less urgent future challenges. September 11 made manifest the danger of postponing preparations for the future. We must prepare now to anticipate future surprises and mitigate their effects.

During the Quadrennial Defense Review, the senior civilian and military leadership of the Department recognized the need to give greater emphasis to mitigating the risk posed by future challenges. Mitigating that risk requires investing now in many capabilities and forces that will not materialize for a decade or more. But we owe it to our posterity to begin a sustained process of investment and military transformation to meet and dissuade future challenges.

Accelerating Transformation

Transformation lies at the heart of our efforts to reduce the risk posed by future challenges. Transformation is fundamentally about redefining war on our terms by harnessing an ongoing revolution in military affairs. As the President has said, “This revolution is only beginning, and it promises to change the face of battle.”

Through an iterative process of transformation and working with our friends and allies, we will attempt to shape the changing nature of military competition and cooperation. Using new combinations of operational concepts and capabilities and the use of old and new technologies and new forms of organization, transformation seeks to exploit our nation’s advantages and protect against our asymmetric vulnerabilities. The goal is to help sustain our strategic position, which helps underpin peace and stability in the world.

The transformation of the Department of Defense is likely to result in fundamental changes in the forms of military operations—such as the way war is waged in the air, on land, and at sea—and over time in a rebalancing of the U.S. portfolio of capabilities and forces. As investment priorities change, the balance in the portfolio of capabilities will shift between manned and unmanned systems, short- and long-range systems, non-stealthy and stealthy systems, between sensors and shooters, and between unprotected and hardened systems.

Transformation has conceptual, cultural, and technological dimensions. Fundamental changes in the conceptualization of war as well as in organizational culture and behavior are required to bring it about. These changes are similar to those occurring in the commercial sector as it transitions from the industrial age to the information age. Succeeding during this period of discontinuous change will require fostering a culture of innovation and experimentation that encourages intelligent risk taking.

The U.S.-led effort in Afghanistan exemplifies how transformation can alter the conditions and very nature of conflict. As President Bush stated in December 2001, our approach in Afghanistan has proven “that an innovative doctrine and high-tech weaponry can shape and then dominate an unconventional

“The enemy who appeared on September 11th seeks to evade our strength and constantly searches for our weaknesses. So America is required once again to change the way our military thinks and fights. And starting on October 7th, the enemy in Afghanistan got the first glimpses of a new American military that cannot, and will not, be evaded.”

*—President George W. Bush,
11 December 2001*

conflict. The brave men and women of our military are rewriting the rules of war with new technologies and old values like courage and honor.”

Focusing Transformation Efforts on Six Operational Goals

To provide focus to DoD’s transformation agenda, the Department has identified six critical operational goals addressing the most significant challenges and opportunities U.S. forces may face in the future:

- Protecting critical bases of operations (U.S. homeland, forces abroad, allies and friends) and defeating NBC weapons and their means of delivery;
- Projecting and sustaining U.S. forces in distant anti-access or area-denial environments and defeating anti-access and area-denial threats;
- Denying sanctuary to enemies by providing persistent surveillance, tracking and rapid engagement with high-volume precision strike, through a combination of complementary air, ground, and naval capabilities, against critical mobile and fixed targets at various ranges and in all weather and terrains;
- Leveraging information technology and innovative concepts to develop an interoperable, joint C4ISR architecture and capability that includes a tailorable joint operational picture;
- Assuring information systems in the face of attack and conducting effective information operations; and
- Enhancing the capability and survivability of space systems and supporting infrastructure.

Each of these goals is detailed below.

Protecting Critical Bases of Operations and Defeating Nuclear, Biological, and Chemical Weapons

Above all, U.S. forces must protect critical bases of operations and defeat weapons of mass destruction and their means of delivery. No base of operations is more important than the U.S. homeland. Defending the American homeland from external attack is the foremost responsibility of the U.S. Armed Forces. Vast oceans and good neighbors do not insulate the United States from military attacks that emanate from abroad. The attacks of September 11 revealed the vulnerability of America's open society to terrorist attacks. The anthrax letters sent last fall also made manifest the danger terrorists armed with NBC weapons pose. Future adversaries will have a range of new means with which to threaten the United States, both at home and abroad. These means will include new forms of terrorism—advanced nuclear, biological, and chemical weapons; ballistic and cruise missiles; and weapons of mass disruption, such as information warfare

attacks on critical information infrastructure. The Department is addressing these emerging operational challenges. For example, it has refocused its missile defense program to better defend U.S. territory, deployed forces, allies and friends against ballistic missiles of any range. It has also emphasized science and technology programs aimed at defending against advanced biological threats.

Projecting and Sustaining Forces in Anti-Access Environments

Future adversaries are seeking capabilities to render ineffective much of the current U.S. military's ability to project military power overseas. Today, U.S. power projection depends heavily on access to large overseas bases, airfields, and ports. Saturation attacks by ballistic or cruise missiles armed with nuclear, biological, or chemical warheads could deny or disrupt U.S. entrance into a theater of operations. Advanced air defense systems could deny access to hostile airspace to all but low-observable aircraft. Military and commercial space capabilities, over-the-horizon radars, and low-observable unmanned aerial vehicles could give potential adversaries the means to conduct wide-area surveillance and track and target American forces. Anti-ship cruise missiles, advanced diesel-powered submarines, and sophisticated mines could threaten the ability of U.S. naval and amphibious forces to operate in littoral waters. Surreptitious attacks employing persistent chemical or biological warfare agents could deny strategic areas to U.S. forces and terrorize U.S. and allied populations.

New approaches for projecting power are needed to meet these threats. These approaches will place a premium on enhancing U.S. active and passive defenses against missiles and NBC weapons; distributing forces throughout a theater of operations and developing new network-centric concepts of warfare; reducing the dependence of U.S. forces on major air and sea ports for insertion; increasing U.S. reliance on stealth, standoff, hypersonic, long-range, and unmanned systems for power projection; enhancing capabilities to project and sustain power directly from an integrated seabase; continuing to improve capabilities for littoral engagements; and developing ground forces that are lighter, more lethal, more versatile, more survivable, more sustainable, and rapidly deployable.

Denying Enemy Sanctuary

Adversaries will also seek to exploit territorial depth and the use of mobile systems, urban terrain, and concealment to their advantage. Mobile ballistic missile systems can be launched from extended range, exacerbating the anti-access and area-denial challenges. Space denial capabilities, such as ground-based lasers, can be located deep within an adversary's territory. Accordingly, a key objective of transformation is to develop the means to deny sanctuary to potential adversaries—anywhere and anytime. This will require the development and acquisition of robust capabilities to conduct persistent surveillance of vast geographic areas and long-range precision strike—persistent across time, space, and information domains and resistant to determined denial and deception efforts. As the President has said, “When all of our military can continuously locate and track moving targets—with surveillance from air and space—warfare will be truly revolutionized.” Denying enemies sanctuary will also require the ability to insert special operations and other maneuver forces into denied areas and to network them with long-range precision strike assets. The awesome combination of forces on the ground with long-range precision strike assets was amply demonstrated in Afghanistan. It offered a glimpse of the potential future integration efforts can confer if consciously exploited through U.S. transformation and experimentation efforts.

Leveraging Information Technology

U.S. forces must leverage information technology and innovative network-centric concepts of operations to develop increasingly capable joint forces. New information and communications technologies hold promise for networking highly distributed joint and multinational forces and for ensuring that these forces have better situational awareness—about friendly forces and those of adversaries—than in the past. C4ISR systems draw combat power from the networking of a multitude of platforms, weapons, sensors, and command and control entities, which are collectively self-organized through access to common views of the battlespace.

In the war in Afghanistan, the United States demonstrated the ability to strike at global range with a variety of networked combat elements from all the services. These included Special Operations Forces from all Services,

the Air Force's intercontinental-range B-2 bombers, elements of an Army Division, several Aircraft Carrier Battle Groups, and a Marine Expeditionary Unit. Yet, this joint action only hints at the potential opportunities that can be exploited through new ways to connect seamlessly our air, sea, and ground forces.

Information technology holds vast potential for maximizing the effectiveness of American men and women in uniform. We must move toward network-centric warfare, increase the importance of connectivity and interoperability as critical performance factors in the design and acquisition of C4ISR and weapons systems, increase the visibility of the Department's evolving Global Information Grid and improve DoD's oversight processes—in requirements, programming and acquisition—for assessing portfolios of capabilities rather than specific weapons platforms. The goal is to enable U.S. forces to communicate with each other, share information about their location and that of the enemy simultaneously, and see the same, precise, real-time picture of the battlespace.

Assuring Information Systems and Conducting Information Operations

Information systems must be protected from attack, and new capabilities for effective information operations must be developed. The emergence of advanced information networks holds promise for vast improvements in joint U.S. capabilities, and it also provides the tools for non-kinetic attacks by U.S. forces. This can include influence operations that seek to shape the mind of an opponent, electronic warfare, and in some instances, computer network attack. At the same time, the increasing dependence of advanced societies and military forces on information networks creates new vulnerabilities. Potential adversaries could exploit these vulnerabilities through their own computer network attacks. The falling barriers to entry in the information realm, brought about through declining costs and diffusion of technology, have increased the range of potential adversaries capable of conducting information attacks. Closely coordinating U.S. offensive and defensive capabilities and effective integration of both with intelligence activities will be critical to protecting the current U.S. information advantage.

Enhancing Space Capabilities

The Department of Defense must enhance the capability and survivability of its space systems. Activities conducted in space are critical to national security and the economic well-being of the nation. Both friends and potential adversaries will become more dependent on space systems for communications, situational awareness, positioning, navigation, and timing. In addition to exploiting space for their own purposes, future adversaries will likely also seek to deny U.S. forces unimpeded access to and the ability to operate through and from space. Space surveillance, ground-based lasers, space jamming capabilities, and proximity micro-satellites will become increasingly available. A key objective for transformation, therefore, is not only to capitalize on the manifold advantages space offers the United States but also to close off U.S. space vulnerabilities that might otherwise provoke new forms of competition. U.S. forces must ensure space control and thereby guarantee U.S. freedom of action in space in time of conflict.

Taken together, these six goals will guide the U.S. military's transformation efforts and improvements in our joint forces. Over time, they will help to shift the balance of U.S. forces and capabilities. U.S. ground forces will be lighter, more lethal, and highly mobile; they will be capable of insertion far from traditional ports and air bases; and they will be networked to leverage long-range precision attack capabilities. Naval and amphibious forces will assure U.S. access even in area-denial environments, operate close to enemy shores, and project power deep inland. Air and space forces will be able to locate and track mobile targets over vast areas and strike them rapidly at long-ranges without warning. These future attributes are the promise of U.S. transformation efforts.

Transformation Pillars

Transformation is a process, not an endpoint. To cement the Department's culture of continual transformation, DoD has emphasized several pillars of activities.

Strengthening Joint Operations and Organizations. DoD is taking steps to better integrate and deploy combat organizations capable of rapid response to events that occur with little or no warning. U.S. forces must train as they

fight and fight as they train. Because U.S. forces operate jointly in conflict, they must train and operate together in peacetime so that they are ready to fight when needed. These joint forces must be scalable and task-organized into modular units that allow combatant commanders to draw on the appropriate forces to deter or defeat an adversary. They must be organized to enhance the speed of deployment, speed of employment and the speed of sustainment. The forces must be highly networked with joint and multinational command and control, and they must be better able to integrate into multinational operations than the forces of today.

Joint forces will be employed to manage crises, forestall conflict, and conduct combat operations. They must be more agile, more lethal and maneuverable, survivable, and more readily deployed and employed in an integrated fashion. They must be not only capable of conducting distributed and dispersed operations, but also able to force entry into anti-access or area-denial environments.

Joint and Multinational Command and Control. Future military responses will require the rapid movement, integration, and employment of joint and multinational forces. To be successful, operations will demand a flexible, reliable, and effective joint command and control architecture that provides the flexibility to maneuver, sustain, and protect U.S. forces across the battlefield in a timely manner. Such a joint command and control structure must reside not only at the joint command, but also extend down to the operational service components. The structure must be networked to ensure shared battlespace awareness. It must be supported by the appropriate doctrine, tactics, techniques, and procedures, as well as a highly trained operational force. Most importantly, it must develop and foster a joint professional culture, a requirement that presents a significant challenge to service and joint training and professional education programs.

The joint command and control system—both the information that flows through the network and the infrastructure upon which it resides—must be secure and protected from an adversary’s information operations or other attacks. U.S. forces require the ability to communicate not only with one another, but also with other government agencies and allies and friends. Such joint and multinational interoperability requires forces that can immediately “plug” into the joint battlefield operating systems—for

example, command and control, intelligence, fire support, and logistics—and perform effectively and efficiently. These forces need compatible doctrine, tactics, techniques, and procedures as well as compatible systems with interoperable standards.

Standing Joint Task Force Headquarters and Standing Joint Task Forces. To strengthen joint operations, the Department is developing options to establish Standing Joint Task Force (SJTF) headquarters in each of the regional combatant commands. Each headquarters will be established under uniform, standard operating procedures, tactics, techniques, and technical system requirements, thereby permitting the movement of expertise among commands. Each SJTF headquarters will have a standardized joint C4ISR architecture that provides a common relevant operational picture of the battlespace for joint and multinational forces. It will also have mechanisms for a responsive integrated logistics system that provide warfighters easy access to necessary support without burdensome lift and infrastructure requirements. SJTF headquarters will also utilize adaptive mission planning tools that allow U.S. forces to operate within the adversary's decision cycle and respond to changing battlespace conditions. In July 2002, U.S. Joint Forces Command will test a prototype SJTF headquarters during Millennium Challenge 2002, an experiment aimed at determining the extent to which the joint force is able to execute rapid decisive operations in this decade.

In addition, the newly established Northern Command will be organized from its inception as a joint command devoid of individual service components.

Related to the development of such headquarters, the Department is also examining options for establishing actual Standing Joint Task Forces (SJTFs). SJTF organizations could provide the organizational means to achieve a networked capability. They would employ new concepts to exploit U.S. asymmetric military advantages and joint force synergies at lower total personnel levels. A single Standing Joint Task Force could serve as the vanguard for the future transformed military. It could undertake experiments as new technologies become available as well as offer immediate operational benefits.

In this regard, the Department is exploring the feasibility of establishing a SJTF for unwarned, extended-range conventional attack to enhance its ability to deny enemies sanctuary. By developing the capability to continuously locate and track mobile targets at any range and rapidly attack them with precision, the United States could overcome a significant future operational challenge. Doing so would require enhanced intelligence capabilities, including from space-based systems and close-in collection assets, additional human intelligence and airborne systems that can locate and track moving targets and transmit that information to strike assets. It would require the ability to strike without warning from the air, from the sea, on the ground, and through space and cyberspace. It will also require that SJTF forces be networked to maximize their combined effects.

Experimentation and New Concepts of Operation

Experimentation

To identify the best available solutions to emerging operational challenges, joint forces and individual services will employ military field exercises and experiments. Over the last century, military field exercises and experiments oriented toward addressing emerging challenges and opportunities at the operational level of war have been important enablers of military innovation and transformation.

Field exercises that incorporate experimentation—at both the joint and the service levels—provide an indispensable means for solving emerging challenges. For instance, with respect to the challenge of projecting power in an anti-access environment, field exercises and experiments will enable the military to identify promising operational concepts for deploying forces into theater for immediate employment and conducting extended-range precision strikes against mobile targets. Further, these exercises and experiments will help to determine if secure access to forward bases is possible and to identify ways to sustain operations for a period sufficient to achieve U.S. objectives. They will also assist the United States in determining which new systems and capabilities will be required, which existing systems and capabilities should be sustained and what combination of transformational and legacy systems should be created.

To ensure that sufficient forces are available for experimentation, the Quadrennial Defense Review stated that Joint Forces Command will be authorized to draw up to 5 percent of U.S.-based forces each year for experimentation activities within tempo guidelines and acceptable operational risk. The findings of this program of field exercises and experiments will feed back directly into the process for determining systems, doctrine, and force structure requirements. Monitoring this program and providing the Secretary with policy recommendations based on its findings will be an important responsibility of the Director of Force Transformation, working with the Chairman of the Joint Chiefs of Staff.

New Concepts of Operation

To lend momentum to the transformation effort and to foster innovation and experimentation, the Secretary has established the Office of Force Transformation within the Office of the Secretary of Defense. This Office will work closely with the Offices of the Under Secretaries of Defense for Policy and Acquisition, Technology and Logistics, and with the Joint Staff, and will report directly to the Secretary and the Deputy Secretary of Defense. The foremost goal of the Office of Force Transformation will be to ensure that transformation efforts are fully linked to the broad elements of national and departmental strategy. The Director of Force Transformation will evaluate the transformation efforts of the Department, recommend steps needed to integrate the work of the Military Departments into other ongoing transformation activities, and monitor ongoing experimentation programs encompassing activities involving risk management and associated metrics.

Coupled with experimentation, the development of joint operational concepts and operational architectures will drive material and non-material transformation solutions and establish standards for interoperability. New operational concepts—the end-to-end stream of activities that define how force elements, systems, organizations, and tactics combine to accomplish military tasks—are therefore critical to the transformation process and may even hold the promise of accomplishing U.S. aims at lower overall force structure and personnel levels. The Chairman of the Joint Chiefs of Staff, supported by the Joint Requirements Oversight Council (JROC), is responsible for developing and validating joint operational concepts and

operational architectures. The Chairman is also responsible for ensuring the compliance of future joint requirements with those concepts and architectures. All DoD components—Services, Combatant Commanders, Joint Staff and Office of the Secretary of Defense elements and Defense Agencies—have a critical role to play in this process.

The Commander-in-Chief, U.S. Joint Forces Command (JFCOM) is functionally responsible to the Chairman for the definition, validation, and exploration of new operational concepts that support realization of breakthrough joint capabilities. In accordance with the Chairman's joint experimentation guidance, JFCOM develops a joint experimentation plan that uses seminars and workshops, wargames, synthetic environment experiments, and field experiments to develop and evaluate joint concepts that are coherently joint, effects-based, knowledge-centric, and highly networked. This summer, JFCOM will test its concept of Rapid Decisive Operations (RDO) in the Millennium Challenge 2002 field experiment. RDO is an experimental concept developed by JFCOM to achieve rapid victory by attacking the coherence of an enemy's ability to fight. It is the synchronous application of the full range of U.S. national capabilities in timely and direct effects-based operations. It employs U.S. asymmetric advantages in the knowledge, precision and mobility of the joint force against an enemy's critical functions to create maximum shock, defeating his ability and will to fight. To the maximum extent practicable, Millennium Challenge 2002 will apply the experiences of Operation Enduring Freedom to determine what transformation lessons they may offer.

Equipping Forces for 21st Century Challenges

While transformation is about more than new capabilities and systems, the integration of new technologies is nevertheless a critical component of transformation. Transformational programs account for 17 percent (about \$21 billion) of all procurement and RDT&E investment in 2003, rising to 22 percent by 2007. This defense program accelerates the development of a number of transformation signposts including the following:

Missile Defense. The Administration established the Missile Defense Agency (MDA) to develop an integrated missile defense system to provide

protection for the United States, its forces, and its allies and friends. Funding has been provided to allow the MDA to develop and test a layered missile defense system to intercept ballistic missiles in all phases of flight and to enable the military services to field elements of the missile defense system as soon as practicable, including the use of prototype and test assets to provide early capability, if necessary. This capability supported the transformational goals of protecting critical bases of operations and defeating NBC weapons, as well as projecting and sustaining power in anti-access environments.

Unmanned Systems. Unmanned surveillance and attack aircraft like Global Hawk and Predator offered a glimpse of their potential in Afghanistan. The 2003 budget increases the number of unmanned aircraft being procured and accelerates the development of new unmanned combat aerial vehicles capable of striking targets in denied areas without putting pilots at risk. The budget includes \$1 billion to increase the development and procurement of Global Hawk, Predator, and several new varieties of unmanned vehicles and to begin development of the Navy's Unmanned Underwater Vehicle.

SSGN Conversion. Rapid engagement capabilities will increase as the Navy converts four Trident strategic nuclear ballistic missile submarines to conventionally-armed SSGNs. The FY 2003 budget allocates \$1 billion to begin the conversion of four Trident submarines so that they can each launch up to 150 Tomahawk Land Attack Cruise Missiles and deliver a contingent of Special Operations Forces. This new class of submarines will provide U.S. forces with unparalleled capacity for high-volume, unwarned strike, clandestine SOF campaigns, and for experimentation involving future payloads.

Advanced Communications Networks. The Department of Defense is adopting new network-centric concepts of operations that proved so important to early successes in Operation Enduring Freedom. Supporting network-centric concepts of warfare will require increased investment in revolutionary communications systems and datalinks. DoD is accelerating the introduction of datalinks to transmit targeting information between ground, air, and naval forces almost instantaneously. Over the next five years, the Department plans to develop and field jam resistant, reliable, and secure links—investing \$150 million in 2003 alone. The Multifunctional

Information Distribution System, for example, will provide a jam-resistant and secure digital network for exchanging critical information. At the same time, the Department is committed to moving more communications to space. It will spend \$1.1 billion in 2003 to continue the Advanced Extremely High Frequency (AEHF) satellite communication system which will provide survivable, jam-resistant, worldwide secure communications for the warfighter and initiate the development of new space-based wideband, secure communications. Another example is the Cooperative Engagement Capability system that—using network-centric technologies—will integrate airborne and shipborne sensors to provide deployed forces a detailed, continuously updated image of the battlespace. Without adding weapons or radars, it extends the range at which a ship can engage hostile missiles to well beyond the radar horizon. If successfully developed and fielded, these capabilities would be the lynchpin of overall U.S. transformation efforts and critical to U.S. forces' ability to accomplish future missions. It would assure the ability to pass information between sensors, forces, and national decision makers nearly simultaneously anywhere in the world.

Advanced Intelligence. DoD is accelerating the development and fielding of capabilities that will provide the ability to sense information globally, continuously, and in all weather conditions, such as Space Based Radar. Space Based Radar would provide persistent surveillance coverage and enhance efforts to locate, track, and engage mobile targets. Such a capability is critical to deny enemies sanctuary. The Department is also making substantial investments in 2003 in a number of efforts to improve the responsiveness of intelligence collection systems and provide better information more rapidly to warfighters.

Long-Range Delivery Systems. In Afghanistan, we have seen the importance of long-range bombers, especially when linked to highly mobile forces on the ground. DoD is pursuing a number of enhancements that will transform the current fleets of B-1, B-2, and B-52 bombers and their ability to strike far greater numbers of fixed and mobile targets anywhere in the world. These enhancements, totaling about \$600 million in FY 2003, will result in aircraft that look the same on the outside, but will have revolutionary capabilities—new avionics, communications, and targeting systems—within.

Precision Attack. DoD is taking steps to shift the balance of its weapons inventory to emphasize precision weapons—weapons that are precise in time, space, and in their effects. New classes of hypersonic weapons will provide precision in time—arriving at their designated aimpoints when they are needed. GPS-guided munitions such as the Joint Direct Attack Munition will provide precision in space—striking targets with unparalleled accuracy in any weather condition, day or night. And new classes of kinetic and non-kinetic weapons will provide precise effects—minimizing collateral effects while maximizing their intended effects whether they be holding underground facilities at risk, defeating chemical or biological weapons, or rendering enemy command and control systems unreliable. The 2003 budget also provides additional funding for new weapons, such as the small diameter bomb, which will increase the number of targets bombers can strike by nearly tenfold. The budget includes \$54 million to develop the small diameter bomb and \$1.1 billion to increase the rate of production for Joint Direct Attack Munition (JDAM) and Laser Guided Bombs, which have played such important roles in the war on terror.

Robust Science and Technology and Procurement

Science and Technology

A strong Science and Technology (S&T) program provides options for responding to a full range of military challenges. Technological superiority has been a characteristic of U.S. Armed Forces and one of the foundations of U.S. national military strategy. It is through the Department's investment in S&T that it develops the technology foundation necessary for modernization efforts, discovers new technologies that produce revolutionary capabilities and provides a hedge against future uncertainty. Tomorrow's military capabilities depend, in part, on today's investment in enabling technologies that can be integrated into new or existing systems and employed using new operational concepts. The Department is exploring new operational concepts, new organizational structures, and new technologies to increase the effectiveness of U.S. Armed Forces.

Maintaining the U.S. technological edge has become even more difficult as advanced technology has become readily available on the world market.

Technologies for sensors, information processing, communications, precision guidance, and many other areas are rapidly advancing and available to potential adversaries. U.S. Armed Forces depend on the Department's S&T program to deliver unique military technologies for the combat advantage that cannot be provided by relying on commercially available technology. The 2003 budget increases S&T investment to \$9.9 billion (2.7% of the DoD topline). This increase underscores the Administration's commitment to a robust S&T program that keeps the United States on the forefront of technology advancement.

These areas include but are not limited to:

- Technologies supporting the development of hypersonic flight systems;
- Advanced power, fuel, and energy systems;
- Information processing, assurance, and operations;
- Sensors;
- Communications, command, and control;
- Intelligence, surveillance, and reconnaissance;
- Lasers and high power microwaves;
- Space systems;
- Biological defense;
- Hard and deeply buried target defeat munitions;
- Precision guidance;
- Combating terrorism;
- Missile defense;
- Mine countermeasures;
- Electronic warfare;
- Unmanned land, sea, and air vehicles; and
- Deep strike.

We must focus our S&T investments in areas that will support developing options for the warfighter to achieve the six critical operational goals.